Towards collaboration between professional caregivers and robots - A preliminary study

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Abstract. In this paper, we address the question of which potential use of a robot in a health-care environment is imagined by people that are not experts in robotics, and how these people imagine to teach new movements to a robot. We report on the preliminary results of our investigation, in which we conducted 40 interviews with non-experts in robotics and a focus group with professional caregivers.

Keywords: Human robot interaction, Assistive robotics

1 Introduction

This paper reports on the preliminary results of our investigation on the use of robots by professional caregivers in a nursing facility for elderly care. The use of assisted living technologies and robots in health-care facilities, particularly for the elderly, has been advocated for decades [Jaschinski and Ben Allouch, 2015], [Topo, 2009]. It is important to investigate how a robot can be introduced in such facilities and whether it could be accepted by patients and professional caregivers. We recently started such a study focusing on our town and its numerous facilities for elderly care, to compare with similar studies in other countries [Heerink et al., 2010].

Our goal here is to evaluate how caregivers could perceive robots and which type of use they imagine for a robot to help them in their work. The attitude towards robot could influence their intention to use the robot for functional tasks or for social entertainment [Gaudiello et al., 2016].

We are also interested by the method they imagine to teach new movements to robots and whether they see operating the robot as a potential part of their work. Indeed, a robot has to be easily controllable by people that are not experts in robotics in such a context, and users could need to add new functions to the robots. Recently, [Novanda et al., 2016] investigated touch, speech and gestures for teaching a robot a nursery rhyme, finding that users do not prefer a particular modality but enjoy less touching the robot. In a previous study with 40 adults we investigated the people's preference towards two different interfaces, and evaluated also their attitude towards kinestethic teaching [Marichal et al., 2016]. In the robotics community kinesthetic teaching is a

widely used method for showing new gestures to the robot and programming it by demonstration [Billard et al., 2008]. The "teacher" is usually a robotics expert. However, there are few examples in the literature where ordinary people interact physically with the robot, and their attitudes toward robots may influence their performance in the interaction [Ivaldi et al., 2016]. Therefore, we are also interested in investigating if kinesthetic teaching is perceived as an intuitive and desirable method by non-experts in robotics, especially by caregivers.

Our study was split in two phases: in the first we conducted semi-directed interviews with ordinary people, while in the second we carried out a focus group with caregivers.

2 Interviews

Forty voluntary adults without expertise in robotics participated to our interviews (age = 36.28 ± 12.57 ; M=20, W=20). The interviews took place in our laboratory (in Inria Nancy, France) after an interaction with the Kinova Jaco robotic arm with a joystick and a graphical user interface (GUI). The experimental protocol is described in [Marichal et al., 2016]. We asked participants how they would like to teach new movements to a robot. The most cited method was the imitation of the human movements (n=19), with a camera or with sensors on the human arm. Seven participants cited they would use the joystick or the GUI they had already tested. The other cited methods were the use of brain-computer interface to control the robot (n=3), and the voice control (n=4). Four participants didn't cite a specific method, and thought the only way was to program directly the robot with a computer to teach new movements.

Only two participants immediately mentioned the kinesthetic teaching method. Five other participants proposed this method after thinking for some time. Interestingly, when we suggested this method to the participants, most of them said this would be efficient and easy to use for them.

We used the results of these interviews to prepare our focus groups.

3 Focus group with professional caregivers

We conducted a preliminary focus group with three professional caregivers (three women, age = 32 ± 1) working in the same health-care facility in Nancy, France. One of them was expert in ergonomic. The focus group lasted two hours. In the first part of the focus group, we presented two different robots: a robotic arm (Kinova Jaco) and a humanoid robot (Softbank Robotics Pepper). Figure 1 shows the pictures presented during this part. We used also a short video of each robot to show their movements. We asked to the participants which use they imagined for each robot in their professional context. In a second part, we asked how they imagined to interact with the robot in order to teach new movements.

A  B 

Fig. 1. The robot pictures presented during the focus group : (A) the Jaco robotic arm of Kinova, (B) the Pepper humanoid robot of Softbank Robotics.

3.1 Use of a robotic arm

After seeing the picture of the robot, the participants imagined to use this robot as a replacement for a person who cannot move his arms. After seeing the video, they said it could be used to help a patient to stand up. One participant suggested to use it as an help for meals (i.e., to help feeding the patients). It could also be used to grab objects that have fallen on the floor, or objects in height. Indeed, the participants said that patients often call them to their rooms just to pick up objects, which they perceive as a waste of time in their work. The imagined use for this robot was "functional".

3.2 Use of a humanoid robot

In contrast to the previous robot, the imagined use of the Pepper robot was more "social". They imagined to use this robot for entertainment (dancing with patients, showing photos...). Also, a reminder function was imagined, e.g., to remind the patients the time to shower. They also suggested to use it to give information, as the time or the activity of the day. However, one participant perceived this robot as a companion, but not as a true help for the caregivers.

After watching the video, the participants imagined to use it as a surveillance device, especially during the night. It could promptly inform the professional caregiver in case of a detected fall.

3.3 Teaching new functions

When we asked how the participants imagined to teach new functions to the robot, their first idea was by imitation: the human makes a gesture, and the robot replicates this movement. However, they reckoned the fact that the different number of joints between the robotic arm and the human arm could make it difficult in practice. Another cited method was the voice control.

We presented in videos four types of interaction: a joystick, a GUI, an imitation interaction using the Leapmotion sensor, and kinesthetic teaching. The

participants confirmed their idea that the imitation was the best option for teaching a new movement. This method was perceived easier and faster to use. However, for tasks that require precision, they said that the kinesthetic method was the best alternative. The participants said that the joystick and the GUI were slower to use. One of participants said that the joystick could be "funny" to use.

3.4 Robot acceptance in a professional context

When we asked which one of the two robots could be the most useful to use in their professional context, one participant answered the Pepper robot as it was seemingly multi-functional. Another participant said that it could be the Jaco robotic arm, as the Pepper could not pick up fallen objects on the floor, and she preferred the more functional aspect of the arm. The last participant would like a mixed between both, but preferred the Pepper if she had to choose only one, for the same reason given by the first participant (multiple functions).

The three participants said they would accept the help of a robot during their work. They perceived the robots as a help to gain more time in their work. Moreover, if a robot as the Jaco robotic arm could help to stand up the patient, the participants said it could avoid back pain: "*The problem in our work is the back*" ("*Le problème dans notre corps de métier, c'est le dos*").

All the participants said they would accept to attend a formation if it is necessary to learn how to use the robot. According to them, the benefit would be important. Moreover, if the method to teach new movements was easy and fast to use, they said they could accept to do it themselves, and not asking the technician of their facility.

4 Conclusion

In this paper, we report on the interviews with 40 adults about the method to teach a robot a new movement. Almost no participant suggested to use kinesthetic teaching in the interviews. However, according to the interviews and then the focus group, this method was seen as effective for some tasks.

We presented the preliminary results of our study on how professional caregivers could perceive the use of robots to help them during their work. We cannot make a general conclusion with only one focus group with three participants at this stage. However, we found some interesting results in our early investigation. Indeed, all the participants to the focus group (professional caregivers) seem keen to accept to work with robots and they acknowledge a potential benefit to the use of a robot to relieve them from the burden of some tasks. This result could be biased by the relative young age of the focus group's participants. However it encourages us to continue the investigation. We will keep conducting more focus groups with other caregivers, including families of the patients, to evaluate the acceptance of a robot as a support for caregiving, identify the best robot for their needs and the tasks where it could intervene. In the future, we plan to

conduct experiments with the two robots in an ecological context to observe the impact of their presence in the health-care facilities.

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